I. Amendments to the Specification

Please replace paragraph [0032] with the following new paragraph:

[0032] When the system 10 is in operation, the control valve 38 is under the direction of the ECU 24b to control the system pressure. When the coupler 12 is disengaged, the control valve 38 is not energized and the system fluid pressure is at a minimum, and the motor 26, connected to ECU 24b via a relay switch 24a, ~~outputs~~ output power is reduced to match the hydraulic system loss. When the coupler 12 is engaged the system pressure is determined by the pulse width modulated ("PWM") signal from the PWM driver 24c connected to the ECU 24b that controls the operation of the valve 38.

Please replace paragraph [0045] with the following new paragraph:

[0045] In certain embodiments of the invention, a simple and low cost method is employed to hold the clutch pack preload pressure or load when the pump is not operating. For example, FIGs. 6A-6C depict a hydraulic coupler system 100 with a hydraulic pump 103 driven by an electric motor 102. The pump 103 draws fluid from a reservoir 101 and delivers the fluid to a cylinder chamber 111 defined by the interior of the walls 106 of a cylinder 112. A proportional relief valve 104 controls the system fluid pressure. Increasing the pressure of the hydraulic fluid pushes a cylinder piston 107 to engage a clutch pack 108. A 2-way valve 105 holds the system preload pressure when the clutch is disengaged, and allows the fluid to flow freely in both directions when the clutch pack 108 is in an engaged condition. The proper amount of lubricant is

BRINKS HOFER GILSON & LIONE
PO Box 10395
Chicago, IL 60611-5599

maintained in the clutch pack 108 via a lube line 117.

Please replace paragraphs [0052] and [0053] with the following new paragraphs:

[0052] Referring now to FIG. 9, there is shown another implementation of a hydraulic coupling system identified generally by the reference numeral 400. In addition to the other previously described components, identified in FIG. 9 with like reference numerals, the system 400 includes a signal conditioner 404, a filter 406, and a thermocouple 408. The signal conditioner 404 conditions the pressure signal from the pressure transducer 22 and transmits the conditioned signal to the microcontroller 46b. The filter 406 functions in much the same way as the strainer 32 (FIGs. 1 and 2) described earlier; that is, the filter 406 removes particulates that may be present in the fluid to cleanse the fluid and to prevent damage to the pump 28 and valve 38. The thermocouple 408 provides a signal representative of the temperature of the fluid in the sump of the clutch pack 18 to the microcontroller 46b, and the temperature of the motor 26 is monitored with a temperature sensor, such as a ~~thermocouple~~ thermocouple 15, coupled to the signal conditioner 404.

[0053] As shown in FIG. 9, ~~the bold~~ certain lines, such as line 16, indicate the high pressure side of the system, whereas ~~the lighter~~ other lines, such as lines 42 and 44, indicate the lower pressure side of the system. By pressurizing the cylinder 20 in the hydraulic coupler 12, the piston 21 applies a force on the clutch pack 18 which, after overcoming the retraction spring force, engages both

sides of the coupler. To maintain a desired pressure in the cylinder, one or more actuators are operated in a controlled manner. Again, the motor 26 of the pump/motor assembly 14 and the valve 38 can be PWM controlled.

Please replace paragraph [0061] with the following new paragraph:

[0061] FIG. 12 illustrates a process 500 for the operation of the mode detection block 426 in the form of a flow diagram. Based on the desired pressure and feedback pressure information, as well as other parameters, the process 500 determines the device mode of the system 400. After the process 500 initiates in step 502, process 500 sets the device mode to mode 1 (total disengagement) in step 504 and progresses to the decision step 506, which receives desired and feedback pressure information 508. Step 506 determines if the desired pressure is greater than the sum of the system back pressure and an upward tolerance, and if the feedback pressure is less than the sum of the system back pressure and the upward tolerance. If these two conditions are not met, the process 500 returns to step 504 so that the device mode remains as mode 1. If the conditions are met, then the process 500 proceeds to step 510, indicating that the device mode is now mode 2 (full clutch engagement). From step 510, the process 500 makes two decisions at steps 512 and 514.

Please replace paragraph [0067] with the following new paragraph:

[0067] In each of the modes, the pump and valve commands are combined in a respective multiplexer 616a, 616b, or 616c. The combined signals are in turn transmitted to the multiport switch 618. The combined signal from the switch locations 619a, 619b, or 619c is transmitted to a demultiplexer 620 which splits the signals into a pump command 622 and a valve command 624. These signals are then combined in the multiplexer 429 into the single signal transmitted to the thermal compensation block 430.

Please replace paragraph [0070] with the following new paragraph:

[0070] FIG. 15 illustrates the operation of the thermal compensation block 430. In brief, when the limiting ~~valve~~ value of the fluid temperature is exceeded, the algorithm ramps down both the motor and the valve solenoid commands. If the motor temperature exceeds the threshold, only the motor command is ramped down.

Please replace paragraph [0072] and [0073] with the following new paragraphs:

[0072] The motor temperature input command 418 is subtracted from an motor temperature threshold 816 in a subtraction block 818. The difference is provided to a gain block 820, and the signal from the gain block 820 is multiplied by the motor command in signal 800 provided by a multiplexer 814 in a block 822. The product is further added to the command signal 800 in a summation

block 824. The signal from the summation block 824 is combined with the valve command signal 800 in a multiplexer 826. If the motor temperature input 418 exceeds the threshold value in 816, the switch 828 switches to the command modified by the motor temperature, as indicated by the switch setting 829a. Otherwise switch 828 passes the output from the switch 812 (i.e., the original command, or the command modified by the fluid temperature), as ndicated by the switch setting 829b. The output from the switch 828 is fed to a demultiplexer 830. From the demultiplexer 830, part of the signal is fed to a saturation limiter 832 that ensures the pump command signal 420 does not exceed an upper threshold. The demultiplexer 830 also supplies a signal that is subjected to a deadband compensation strategy 834 to compensate for any deadbands in the valve operation. The compensated signal is then supplied to another saturation limiter 836 that prevents the valve command 422 from exceeding an upper threshold limit.

[0073] The performance of torque ~~transfers~~ transfer devices, such as the hydraulic coupling systems described above, may vary in production due to a number of factors including manufacturing tolerances. This device variation may be large enough to require matching individual torque transfer devices with ECUs calibrated for specific performance ranges. Alternatively, data from device sensors, such as pressure, temperature, and electrical current level, can aid the algorithm in determining the device performance range. Based on the system performance, control strategy algorithms can be adjusted.

Please replace paragraph [0079] with the following new paragraph:

[0079] The algorithm 900 includes an outer loop 902 provided with vehicle mileage from a mileage counter 906, vehicle speed 910, and steering wheel rate 912. The outer loop 902 computes in step 904 the cumulative vehicle mileage from born-on date to pre-set mileage termination point based on the vehicle mileage. The outer loop also computes in step 908, based on the vehicle speed 910 and steering wheel rate 912, the minimum vehicle speed limit to prevent vehicle shudder during turning maneuvers. Next in step 914, the outer loop 902 determines the default selection for the compensated desired actuator current in a control solenoid current step 918 in an inner loop 904. Alternatively, an external override control 916 can provide a desired actuator current override for the control solenoid current step 918. A solenoid current command, based on the desired duty cycle, is supplied to the solenoid device in step 920. The solenoid current is also measured which is fed back to step 918 to compensate the desired actuator current. The measured solenoid current is also fed to step 922 which modulates the minimum allowable solenoid pressure to engage the coupler clutch system. The ~~modulate~~ <u>modulated</u> signals from step 922 are also supplied to the pressure sensor (identified by block 924), which supplies in turn a feedback signal to the compensation step 918. Based on measured temperature, pressure and speed difference across the clutch and separator plate, a look-up table may be utilized to yield desired or available torque output.

BRINKS HOFER GILSON & LIONE
PO Box 10395
Chicago, IL 60611-5599